

Zero Retries issue 0038 2022-03-18

Advanced Amateur Radio - Data Communications; Space; Microwave... the fun stuff! The Universal Purpose of Ham Radio is to have fun messing around with radios - Bob Witte K0NR. Ultimately, amateur radio must prove that it is useful for society - Dr. Karl Meinzer DJ4ZC. We are confronted by insurmountable opportunities! - Pogo. Nothing great has ever been accomplished without irrational exuberance - Tom Evslin. Irrational exuberance is pretty much the business model of Zero Retries Newsletter - Steve Stroh N8GNJ. What's life without whimsy? - Dr. Sheldon Cooper.

Zero Retries is a unique, quirky little highly independent, opinionated, self-published newsletter about technological advancement in Amateur Radio, for a self-selecting niche audience, that's free (as in beer) to subscribe.

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor (Emeritus)

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0038>

Request To Send

Countdown to [Hamvention](#) 2022 - May 20-22, in Xenia, Ohio - 9 weeks...

Jack Stroh Update

I'm sad to report that Zero Retries Late Night Assistant Editor Jack Stroh, profiled in Zero Retries 0031, is terminally ill. Fortunately he is not in pain. Thus, Jack has concluded his duties as Late Night Assistant Editor, transitioning to Late Night Assistant Editor (Emeritus). Jack will live out his remaining time resting comfortably and being spoiled as much as possible amid his loving family. I will greatly miss his assistance late at night... and of course his companionship and love as my little buddy.

de Steve N8GNJ

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Halo TD-XPAH - New 902-928 MHz 802.11ah Radio



Image courtesy of Crowd Supply / Teledatics

Post Publication Update:

As discussed below, the IEEE standard relevant to this unit is 802.11ah. The corresponding Wi-Fi Alliance certification is [Wi-Fi HaLow](#). Note the subtle difference in spelling - this product uses “Halo”; Wi-Fi’s spelling is “HaLow”.

I’ve mentioned Crowd Supply a number of times as the [host of many radio projects](#). In addition to just purchasing devices, creators can run crowdfunding campaigns there. A new crowdfunding campaign has started for the [Halo TD-XPAH](#) which is described as *The first open source 802.11ah scalable long range Wi-Fi development platform for engineers and experimenters*.

I also ~~briefly~~ cursorily discussed the 902-928 MHz band in Zero Retries 0030.

The [Wikipedia article on 802.11ah](#) is enlightening. I’m amused when data rates of 100 kbps are referred to as suitable only for device telemetry, not actual communications.

This device also claims to implement [802.11s](#) which is a mesh networking standard. In support of that, it can be configured to be a standalone unit (no host computer needed) and impressively, you do so by setting a DIP Switch! (I can’t remember when I last saw a unit provide the simple expedient of setting a mode via a DIP Switch!)

As for hardware:, the unit is powered by, and communicates over a USB-C connection. It does have an external antenna connector, (it looks to me like a Micro-miniature coaxial - MMCX), so it’s possible to use a better antenna than the “rubber duck” antenna provided. It also has an expansion port and the crowdfunding campaign offers a 2.4 GHz Wi-Fi interface and an Ethernet interface.

At the moment, I can’t determine if it would be usable “out of the box” or to make it usable you would have to be comfortable with software development. For example, there’s no mention of how to interact with the device (for example, no mention of an easy-to-get-started web GUI, for us non-developer mortals). I guess I should take the hint that the full title of the unit on Crowd Supply is Halo TD-XPAH Development Board.

This unit shows a lot of promise:

- It’s open source software and hardware.
- It’s standards-based for the on-air protocol and the mesh networking.
- It uses a radio designed-for-purpose ([Newracom NRC7292](#)), not a downconverted or hacked Wi-Fi chipset.
- It’s for an underutilized band (at least by Amateur Radio Operators).
- The data rate is reasonable - you can do a lot with 100 kbps.
- This implementation is only \$99 (\$150 if you want to add a Wi-Fi gateway or an Ethernet interface).

Of course, to make it useful for experimentation you have to have at least three - a pair to communicate between, and a third to experiment with joining the network (and perhaps loan to a couple of nearby friends).

I’ve long thought that there is a need for a “Neighborhood Area Network” for basic data communications in an emergency and 2.4 GHz and 5 GHz just aren’t adequate without heroic measures (like an outdoor unit mounted high up), and this unit might be a suitable basis for such a system.

In the end, this... is interesting to me, especially for the use of IEEE 802.11ah and 802.11s. 902-928 MHz has been a “standards-free band”¹ since communications use was authorized there in 1985 because it’s mostly unique to North America. I’ll likely join in this campaign as the buy-in isn’t bad. I plan to contact the developers and ask some questions, and if there’s good info provided I’ll do a followup article.

My thanks to Martin Rothfield W6MRR who pointed out this device to me.

I told a related story in Zero Retries 0000 - Story 3: The Radios That Weren't; Part 1. Unfortunately space doesn't permit me to reprint it in this issue. I think it's relevant to mention here because the band that radio used was also 902-928 MHz. If the Halo TD-XPAH takes off for Amateur Radio use, perhaps this "bit of unfinished business" can be remedied - after 25 years.

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Insight Into the Chip Shortage for a Small Amateur Radio Manufacturer

In the APRSSIG thread "[Is Open Tracker Abandonware?](#)", Scott Miller N1VG of [Argent Data Systems](#) posted this insight into the struggles of a small company making products for Amateur Radio.

The Tracker4 was introduced a while back but we had to take it off the market because the WiFi modules and microcontrollers are unobtainium. We're not expecting to be able to get more of the MCUs until summer of next year.

The SiLabs WiFi modules were also a huge pain in the butt. Hard to inspect and prone to soldering problems, and SiLabs never got the firmware totally stable. They got the design in the acquisition of BlueGiga (which they wanted more for their BLE product line, I understand) and then dropped it in favor of a product line they got somewhere else, so it's an orphan and getting them to fix anything is like pulling teeth. So I'm not too broken up about those going away, but replacing all of the code that was written specifically for it is going to take a while.

So the old stuff is still available as long as we're still able to get parts. Some of the other items like the SSTVCAM also have supply issues, so our radio-related offerings are slim right now. We've just about got mass production squared away for the ADS-SR1 simplex repeater again (we got really lucky and snagged 3,000 MCUs that unexpectedly popped up) and we can probably get the ADS-WS1 weather station back into limited production before long. We're also working on an air quality monitor version.

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ZR > BEACON

Experimental Radio News 4

[Experimental Radio News 4](#) has published - informative and recommended!

Movement on Amateur Radio Service Rate Rules Soon?

I'm not sure what to think of this:

"Abraxas3d" is Michelle Thompson W5NYV who is "co-founder, CEO, and a board member of [Open Research Institute](#) and recently a member of the [FCC's Technological Advisory Council \(TAC\)](#).

When I said "I'll be curious to see if any details are forthcoming," the reply from Abraxas3d was:

Some good momentum through efforts in multiple states and some signs of life from the top. It will take additional years.

Icom 3rd Generation D-Star Repeaters

I have not been paying attention to D-Star of late, but Icom has been busy creating their [3rd generation D-Star repeaters](#). The two big advancements in this new generation of D-Star repeaters are that a controller is now integrated, and the repeaters are now dual-mode D-Star and FM. The Zero Retries Interesting part of these new repeaters is the **ID-RP1200VD 1200 MHz repeater** that can be used either as voice or data. When configured for data, the data mode is "Digital Data" which is "128 kbps" using a 100 kHz channel. As I understood it, the original 1200 MHz DD repeater didn't actually work as a repeater, but more of an access point - sequentially it received a packet of data, buffered it, and then retransmitted it (but not simultaneously), thus the throughput wasn't very close to the stated "128 kbps". Perhaps this repeater corrects that earlier implementation.

The corresponding user radio that works with the ID-RP1200VD is the [Icom IC-9700](#) 144 / 440 / 1200 MHz radio. If I wanted to create an Amateur Radio "data intercom", and prices weren't much of an object (\$1900, but [currently on sale at HRO for \\$1700](#)), this repeater and IC-9700s (or legacy Icom ID-1s occasionally on eBay) would be a good way to implement such a system. I discussed the Icom ID-1 and a number of D-Star 1200 MHz repeaters that are still active in Zero Retries 0009.

FCC to Consider Receiver Standards (Again)?

FCC to consider mandating receiver standards - *again*. ARS Technica article: [STAY IN YOUR LANE — FCC considers crackdown on bad wireless receivers after 5G/altimeter debacle](#). This is a perennial topic at the FCC - they've considered this issue *several* times. Prior to the recent radio altimeter issue, the last dustup over receiver standards was a service that had license for spectrum adjacent to the the GPS band, and like the radio altimeter hysteria, there was an orchestrated full-on hysteria campaign that if that service went into operation, GPS operations (including airplanes) would be adversely affected. The bottom line from *that* debacle was that most GPS receivers had (and continue to have) overly broad receivers. The bottom line is that manufacturers of radio systems and components want to continue to make radio systems as inexpensively as possible, and make the value judgement that it's cheaper to orchestrate a hysteria campaign to suppress operations in adjacent spectrum rather than design good radio systems that ignore signals in adjacent spectrum. The FCC stance ought to be simple - no relief if your radio system is adversely affected by signals outside the radio system's intended portion of spectrum.

If you want a wonk's view of the challenges / opportunities ahead at the FCC (little to do with Amateur Radio) I recommend [this article](#).

AREDN Nightly Build 1036 - Perl Not Included

[AREDN Nightly Build 1036](#) is a bit of a milestone for the development team. It's the first version to be completely free of the Perl language and all the libraries that support it. **Kudos, AREDN developers!**

AREDN Ambassador Orv Beach W6BI reports on the AREDN Facebook group:

AREDN nightly build 1049 is the build you've been looking for! Not only does it include previous work done to [dump perl], it now includes the tunnel modules by default!

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Updata

- In Zero Retries 0031 I discussed the [Motorola Solutions T800 Radio](#) portable radio that could transmit and receive text messages over "GMRS" using a Bluetooth link to a smartphone and an app. I purchased a pair on Amazon, but I didn't want to be tempted to play around sans GMRS license, so they stayed in the package. Last week I got my GMRS license - I, and my family are now WRPS598. I opened the T800 package to start experimenting and quickly discovered that the T800 is actually a Family Radio Service (FRS) radio, not GMRS. I just didn't read the Amazon description clearly enough, and the Motorola Solutions blurb doesn't mention FRS at all. It's "clear as mud" about FRS versus GMRS given that all of the FRS channels are included in the frequencies used by GMRS, but a [chart](#) on [The RadioReference Wiki](#) cleared up my confusion. That said, the data experimentation with the T800 radios is still valid, just no concerns about calligns or licenses in FRS, so I'll continue that experiment.
-

Feedback Loop

- Chris Sullivan VE3NRT re: Zero Retries 0035:** *Steve, thanks for another interesting edition. If the RPX-100 doesn't pan out, something else will. It is a hole that needs to be filled. I'd like to see all radios targeted beyond the commodity stuff include quadrature inputs and outputs. A programmable internal CPU with open source (or at least open API) code would be a plus. I agree with Lyle (another guy I remember from the eighties) - just give me the bandwidth. We're lucky with the Canadian regs, but the unfortunately the equipment and software tends to be defined by the US market. Speaking of little countries adjacent to big ones, a club member who hails from New Zealand (I'm originally Australian, so I once was the big fish) told me that their regulators approach was to let you do what you want, then you'd go to them and say "I have this new mode, would you please put it in the regs" and they would. It's almost the same here, if no-one complains no-one will come knocking. The regulators have better things to do with their time. I have an idea. Promote wide bandwidth data communications in Canada, and everyone south of the border will get jealous and demand change! Yesterday I got GNU Radio to transmit a signal through my ancient SoftRock RXTX Ensemble and received it on my main transceiver. I am happy, for now. Next, I will try to modulate it.*

Chris - I've always admired Canada for their more relaxed administration of, and their progressive attitude about advancing technology in Amateur Radio. Your idea of implementing advanced modes in Canada as an "example" to the US was also mentioned to me by a friend with knowledge of Amateur Radio regulatory issues.

- John Kreno N3XKD re: Zero Retries 0035** (comment posted on Zero Retries 0036): *Something that I came across after having read zero retries 0035, a little more development on this paired with a raspi, and you have a "high speed" data node at a reasonable (once Rpi prices come down) Price <https://www.crowdsupply.com/cariboulabs/cariboulite-rpi-hat#products>*

John - The CaribouLite is indeed an impressive unit. I mentioned it in Zero Retries 0028 and I look forward to receiving my two units, hopefully in May. While the CaribouLite will be great for experimenting, its picopower transmit power will limit it to across-the-shop experimentation until we get usable, reliable, driver amplifiers specifically for Amateur Radio.

- Karl Kremer K5KHK re: Join the Fun on Amateur Radio:** *Remote testing is good for when there is no other alternative, but going to a local club's VE testing has the advantage of actually meeting people from the ham radio community. This might be your first step in joining a club. Ham radio - depending on which one of the thousand hobbies that make up ham radio you pick - may have a steep learning curve, so getting to know people who can answer questions and lend a hand for challenging projects is a good thing. You can find in-person testing on the ARRL web site <https://www.arrl.org/find-an-amateur-radio-license-exam-session> and in [HamStudy.org](#) (also a great site to study for the test). Don't forget that local clubs often have license classes as well (I teach the Technician class in Rochester, NY at Rochesterham.org)*

Karl - Thanks for the input! I'm learning through various new exposures such as my work with [Amateur Radio Digital Communications](#) that a lot of (my) assumptions from decades of experience in Amateur Radio aren't necessarily valid in the 2020s. Although COVID-19 certainly accelerated remote testing, there was (mostly unmet) demand for remote testing before COVID-19. One case I have learned of is that many young folks don't have time or ability to travel to an in-person Amateur Radio test. Another is that many young folks, while interested in Amateur Radio as a technical and self-education activity, have no interest in joining an Amateur Radio club where they don't see themselves represented in the membership of the club. Thus, I'm defaulting to promoting online Amateur Radio testing rather than in-person testing.

- **Mark Davis AD7EF re: Zero Retries 0033:** “Eventually there will be an open source equivalent of VARA FM that provides equivalent functionality.”
Unlicensed (no cost) VARA FM offers throughput multiple times faster than 1200bps packet (or realistic 9600bps packet, for that matter), and does so even under marginal conditions, where packet is unusable. The technical “chops” to implement a radio modem technology on par with VARA FM, running on readily available general-purpose computer hardware/OS, is a rare and valuable commodity. Also, you suggest that 6 meters might offer some significant advantages for extending the amateur radio data network... depending on propagation circumstances, the coding and modulation schemes used in VARA HF might be better suited for taking advantage of this band for data communications. Implementing a radio modem system for optimal data-communications in both the HF and VHF/UHF regimes is an even more daunting prospect. What makes you think someone will ever develop an open source alternative to VARA HF / VARA FM?

Mark - good question! Here’s why I think that an open source alternative to VARA HF / FM will eventually emerge. My primary interest in VARA is VARA FM; nothing against the advancements that VARA HF has demonstrated, but the accomplishments of VARA FM are, to me, more compelling.

- First, it might help to know that I discussed VARA FM in depth in Zero Retries 0004, and discussed a potential open source equivalent to VARA FM (suggested name - RAMA) in Zero Retries 0006.
- Since Zero Retries 0004 and 0006, the primary reason I feel that an open source equivalent to VARA FM *will* eventually emerge is that the more widespread the usage of VARA, the more exposure there will be to what is possible for higher data speeds and robustness on VHF / UHF FM channels. For example, until the advent of VARA FM, I wasn’t aware that you could push 25 kbps on a 20 kHz FM channel. Thus we now know that *can* be done with “ordinary” Amateur Radio resources - a radio with a flat audio connection, a high-resolution audio interface, and a reasonably powerful host computer.
- VARA’s author has done a masterful integration job, but in the end, VARA is a collection of various techniques that are already in use, including Forward Error Correction (FEC), varying modulation index, use of OFDM, channel sounding, handshaking, etc.
- VARA was implemented as a standalone mode, essentially a modem and thus doesn’t have any interoperability with other modes such as Packet Radio. VARA is accessed as such from other software that has “hooks” specifically for VARA. That’s certainly a workable approach, but perhaps it would be better, more functional, to include a “VARA-like” mode in, for example, the Dire Wolf Software TNC?
- VARA FM requires Windows, which is getting increasingly problematic as Windows will simply decide to shut itself down, install software updates, mess with settings, etc.
- VARA isn’t open source, and charges a fee for a license key to operate at the speed levels that make VARA FM attractive. Many Amateur Radio operators that are capable of software development simply take that as a challenge to create a new system.

Join the *Fun* on Amateur Radio

If you’re not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!
- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.
- My ongoing Thanks to pseudostaffers [Dan Romanchik KB6NU](#) and [Jeff Davis KE9V](#) for continuing to spot, and write about “Zero Retries Interesting” type items, on their respective blogs, from Amateur Radio and beyond, that I don’t spot on my own.
- [Southgate Amateur Radio News](#) consistently surfaces “Zero Retries Interesting” stories.
- The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

Substack has an IOS App! If you read Zero Retries on an iPad or iPhone, the [Substack Reader app](#) might be a [more pleasant reading experience](#) than email, web, or RSS. An Android app is apparently coming soon - [sign up](#) to learn when it’s ready.

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All previous issues of Zero Retries are available without restriction (no paywalls). For some background, Zero Retries 0000 was the **Introduction Issue**. Zero Retries 0026 and Zero Retries 0027 were a **2021 Year End Review** of Zero Retries.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him)

These bits were handcrafted in beautiful Bellingham, Washington, USA
2022-03-18

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[1](#)

I think I’m correct in saying this. The only systems deployed in 902-928 MHz that I’m aware of that aren’t proprietary implementations are Amateur Radio FM repeaters and radios.